COUPLING

[0001] Priority is claimed to German Patent Application No. DE 102 32 286.4, filed on 18 July 2002, the subject matter of which is hereby incorporated by reference herein.

BACKGROUND

[0002] The present invention relates to a coupling for connecting a driving machine part and a driven machine part, e.g., shafts, wheel hubs or the like, from an intermediate shaft and articulated lever couplings situated at the ends of the intermediate shaft, each having at least three identical articulated levers which engage via elastic joints situated at their ends with the intermediate shaft and with the adjacent machine part to be connected.

[0003] Couplings of this type are known for permitting an elastic interconnection of shafts for different purposes. These couplings have a high torsional rigidity. They function to compensate for radial and axial misalignment.

[0004] German Patent DE 42 05 666 C2, the subject matter of which is incorporated by reference herein, describes such a coupling in which the joints of the articulated lever engage with the intermediate shaft by way of secantially aligned wrist pins and engage by axially aligned wrist pins with a shaft to be connected. These couplings have proven successful. The elastomer bearings mounted on the shafts to be joined undergo mainly cardanic deformation in two axes when the coupling undergoes a deflection. It is therefore necessary to use spherical bearings as elastic elements for these bearings. This limits the radial lifetime of the spherical bearings, which cannot be increased arbitrarily. These bearings also require a considerable installation space.

SUMMARY OF THE INVENTION

[0005] An object of the present invention is to provide a coupling of this type having a long lifespan. A further or alternate object of the present invention is to provide a coupling of this type that is able to transmit substantially large radial loads using the same or reduced installation space.

The present invention provides a coupling for connecting a driving machine part and a driven machine part, e.g., shafts, wheel hubs or the like, comprising an intermediate shaft and articulated lever couplings provided at the ends of the intermediate shaft. Each coupling has at least three identical articulated levers, engaging via elastic joints situated at their ends with the intermediate shaft and with the adjacent machine part which is to be connected. The axes (21) of the elastic joints (10) of each articulated lever (9) are perpendicular to an axial plane (22, 23) which is parallel to the articulated levers (9) and passes through the axis (8) of the intermediate shaft (4) and the axes (6, 7) of the machine parts (2, 3) that are to be connected.

[0006] With the novel coupling, the axes of the elastic joints of each articulated lever are aligned perpendicularly to an axial plane parallel to the articulated levers, which includes the axis of the intermediate shaft and the axes of the shafts to be connected. This configuration of the joints results in deformation of the elastomer bearing which is attributable primarily to torsion. This homogeneous deformation is tolerated better by the bearing. Only a very small portion of the deflection is cardanic. The bearing elements used may be optimized better to radial loads. Their spherical design may have larger radii; in the extreme case, cylindrical elements are used.

[0007] The articulated jointed levers are configured in a star pattern. The axes of the joints of each articulated lever are parallel. The preferred number of articulated levers used is four. In this case the axial plane may pass through the center of the two opposite articulated levers. Such a possibility also exists when using six articulated levers.

[0008] The axes of an articulated lever coupling are aligned so that they come to lie in a radial plane. Therefore, the intermediate shaft and the shafts to be joined are equipped with connecting flanges having radially and axially protruding claws. These claws support the bearing journals for the joints. The bearing journals may be integrally joined to the bearings or manufactured separately and mounted on the claws. In a number of applications it is advantageous if the bearing journals have a conical shape having a non-blocking conical seating. This facilitates dismantling.

[0009] The joints may be equipped with spherical bearings. However, it is advantageous if at least one joint is equipped with an articulated lever having a cylindrical bearing. The cylindrical bearing allows greater forces to be transmitted. The elastomer layer of the bearing is preferably bonded to the adjacent metal parts by vulcanization.

[0010] In an advantageous manner, the joints are provided with protruding lugs on their outer bearing shells, these lugs cooperating with a stop on the coupling to provide protection against loss in the event of damage to the elastomer.

[0011] For cost reasons, the connecting flange and the bearing journal may be manufactured separately. In this case the bearing journals are mounted on the intermediate shaft and/or the shafts to be joined by stud bolts.

[0012] When connecting shafts that may be subject to major misalignments, it is advantageous if the articulated levers are designed as lamellae in the axial direction of the intermediate shaft. These lamellae may absorb some of the misalignment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention is discussed below with reference to the drawings, in which:

[0014] Figure 1 shows a front view of the coupling;

[0015] Figure 2 shows an articulated lever coupling in a side view without the articulated lever or joints;

[0016] Figure 3 shows the coupling in a longitudinal sectional view without the joints or articulated lever; and

[0017] Figure 4 shows a front view of a joint level coupling having six articulated levers.

DETAILED DESCRIPTION

[0018] Coupling 1 shown in a front view in Figure 1 connects two shaft ends 2 and 3, only shaft end 2 being visible in the front view. Articulated lever couplings 5 are mounted in a star pattern around axes 6 and 7 of shaft ends 2 and 3 which are to be joined and axis 8 of intermediate shaft 4. Four articulated levers 9 of the same design are provided, engage with bearing journals 11 of connecting flange 12 of intermediate shaft 4 via joints 10 provided at their ends and with bearing journals 13 of connecting flange 14 of shaft end 2. Bearing journals 11 and 13 are integrally joined to claws 15 and 16 on connecting flanges 12 and 14. Bearing journals 11 and 13 are designed in a conical shape having a non-blocking conical seating. All joints 10 are equipped with cylindrical bearings 17. Articulated levers 9 have lugs 18 protruding on their outer ends via which they are held by bolts 19 on flanges 12, 14. This is also additional protection in the event one of elastomer layers 20 is damaged.

[0019] Axes 21 of elastic joints 10 of each articulated lever 9 are aligned perpendicularly to axial planes 22 and 23 through axis 8 of intermediate shaft 4 and axes 6 and 7 of shaft ends 2 and 3 to be joined and running parallel to articulated levers 9. Axes 21 of joints 10 of each articulated lever 9 are parallel.

[0020] Figure 2 shows an articulated lever coupling 5 in side view. The joints themselves together with the articulated levers have been omitted to clearly illustrate the allocation of bearing journals 11 and 13. Bearing journals 11 and 13 and thus axes 21 of joints 10 lie in a radial plane 24. Connecting flanges 12 and 14 have radially and axially protruding claws 15 and 16 which support bearing journals 11 and 13 for joints 10. The design of connecting flanges 12 and 14 together with protruding claws 15 and 16 permits the flanges to nearly penetrate one another, so that bearing journals 11 and 13 come to lie in the same radial plane 24.

[0021] Figure 3 shows coupling 1 without articulated lever 9 and joint 10 in a sectional view. Connecting flange 14 is bolted to a gear (not shown in detail here) by screws 27. To ensure a good transmission of force, end gearing 28, provided on the connecting flange, engages in a

corresponding end gearing on the gear. Therefore, extremely high forces may be transmitted. Connecting flange 14 is joined to connecting flange 12 of intermediate shaft 4 via the articulated levers and joints (not shown in Figure 3). For manufacturing and assembly reasons, intermediate shaft 4 is split. The two parts of intermediate shaft 4 are held together by bolt 29, an end gearing 30 also being provided at the connecting point. Second connecting flange 12 of intermediate shaft 4 is connected by the articulated lever and joints (not shown here) to connecting flange 14 of shaft end 3 which is connected to a wheel hub (not shown here). The torque coming from the gear is consequently transmitted via flange 14 and 12 or 12 and 14 and bearing journals 11 and 13 attached thereto as well as the articulated levers to be used together with joints to the wheel, e.g., of a streetcar.

[0022] Figure 4 shows an embodiment of coupling 1 in which articulated lever coupling 5 has six articulated levers 9 having particular joints 10. In this case, each connecting flange is provided with three claws 35.